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Argostemma ehuangzhangense (Rubiaceae), a new species from Guangdong, China

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Abstract

Argostemma ehuangzhangense, a new Rubiaceae species from E'huangzhang Nature Reserve, Guangdong Province, China, is here described and illustrated. A morphological comparison between the new species and its putative relatives, *A. lamxayanum*, *A. laotica* and *A. verticillatum*, is presented. The new species is mostly similar to *A. laotica*, but they can be distinguished from each other since *Argostemma ehuangzhangense* presents solitary flower (vs. 2-flowered inflorescences), flower lobes 4 (vs. 5) and anthers opening by longitudinal slits (vs. apical pores). In a preliminary IUCN Red List status of *Argostemma ehuangzhangense* this species is assigned as Vulnerable (VU).

Keywords

Argostemma ehuangzhangense, China, Guangdong, new species, Rubiaceae

Introduction

The genus *Argostemma* Wall. (Wallich 1824) belongs to the coffee family, Rubiaceae (subfamily: Rubioideae), and in its own tribe Argostemmateae (Bremer 1987; Bremer and Manen 2000). *Argostemma* is a large genus of more than 160 species and is widely distributed in the Old World tropics with most species occurring in SE Asia and two species in west tropical Africa (Bremer 1989; Sridith and Puff 2000; Mabberley 2017;

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Lanorsavanh et al. 2020). In China, six species of *Argostemma* were recorded (Chen and Taylor 2011). Key morphological characters of *Argostemma* are (i) opposite or verticillate leaves that are slightly to markedly anisophyllous, (ii) 4- or 5-merous flowers without nectaries, (iii) white and rotate corollas, (iv) Inner surface of corolla tube glabrous, (v) free anthers or coherent into a tube, (vi) anthers with opening by longitudinal slits or apical pore, and (vii) sometimes connective prolonged at the apex (Puff et al. 1995; Chen and Taylor 2011).

An unknown *Argostemma* species was discovered during recent field surveys conducted between April 2017 and May 2018 at the E'huangzhang Nature Reserve, Yangchun City, Guangdong Province. The flowers of the unknown *Argostemma* species are clearly 4-merous and it differs from all known *Argostemma* species in China. In addition, we compared the unknown *Argostemma* from E'huangzhang Nature Reserve against *Argostemma* species occurring in Southeastern Asian which presented morphological characters divergent from those in our specimen. Thus, it was concluded that the unknown *Argostemma* from E'huangzhang Nature Reserve is a new species, which is hereby described and illustrated here.

Materials and methods

This study was conducted based on living and dried herbarium specimens collected from nearby Wufu Waterfall in the E'huangzhang Nature Reserve. Herbarium specimens at IBSC, KEP and KUN, as well as types at IBSC, K and NY, were examined for morphological comparisons (acronyms follow Thiers 2022). Taxonomic literature of the genus for Thailand (Sridith and Puff 2000; Sridith and Larsen 2004; Sridith 2007, 2009, 2012), China (Chen and Taylor 2011), Vietnam (Vu et al. 2020), Laos (Lanorsavanh and Chantaranothai 2013, 2016, 2019; Lanorsavanh et al. 2020), and Myanmar (Kress et al. 2003; Tanaka et al. 2010) were consulted.

Results

Argostemma ehuangzhangense is similar to *A. lamxayanum* and *A. laotica* by sharing the following morphological features: leaves isophyllous, verticillate or pseudo-verticillate; and leaves, pedicels, calyx and petals pubescent (Table 1). However, *Argostemma ehuangzhangense* is distinct from these species by its flower solitary (vs. flower (1-)2–10); peduncles absent (vs. peduncles short or 1–3.5 cm); flower 4-merous (vs. 5-merous); anther length 1.2–1.5 mm (vs. longer than 2 mm) and anthers longitudinal slits (vs. apical pore) (Table 1).

Amongst the *Argostemma* species known in China, *A. verticillatum* is morphologically similar to *Argostemma ehuangzhangense*. *Argostemma verticillatum* differs from the latter by its (i) glabrous stem, pedicels and calyx, (ii) inflorescence cymose and comprised of 1–3 umbelliform, (iii) flowers 5-merous, and (iv) filaments short (Table 1).

Table 1. Comparison of morphological characters between *Argostemma ehuangzhangense*, *A. lamxayanum*, *A. laotica* and *A. verticillatum*.

Characters	*A. ehuangzhangense*	*A. lamxayanum*	*A. laotica*	*A. verticillatum*
Plant height (cm)	1–4	2–12	1–2.5	2–10
Leaf blade shape	ovate to elliptic	elliptic, oblong or ovate	elliptic or oblanceolate	lanceolate or ovate-lanceolate
Leaf blade size (cm)	0.5–2.5×0.3–1.2	0.7–4×0.4–2.0	1–1.7×0.4–0.7	1–7× 0.7–2.5
Lateral leaf veins	3–4-paired	4–8-paired	3–4-paired	4–7-paired
Leaf indumentum	both surfaces antrorse strigose (abaxial sparsely pubescent on the vein)	both surfaces hirsute	both surfaces pubescent	both surfaces glabrous or sparsely pubescent
Inflorescences	flowers solitary; peduncles absent	umbelliform,1–10-flowered; peduncles 1–3.5 cm, glabrous	2-flowered; peduncles very short, pubescent	umbelliform, 1–3-flowered, composed cymose; peduncles 1–3 cm long, glabrous
Pedicel	8–18 mm, pubescent	4–12 mm, pubescent	6–7 mm, pubescent	5–10 mm, glabrous
Calyx lobes	4, pubescent outside	5, pubescent outside	5, pubescent outside	5, glabrous both side
Corolla lobes	4, pubescent outside	5, pubescent outside	5, pubescent both side	5, glabrous both side
Filament length (mm)	3.5–4	2.5–3	2.5–3.2	1–1.2 (-2.5)
Anthers coherence	connivent	free	connivent	free
Anther length (mm)	1.2–1.5	2.5–3	2.2–2.5 mm	2–3
Anther dehiscence	longitudinal slits	apical pores	apical pores	apical pores

Taxonomic treatment

Argostemma ehuangzhangense **H.G.Ye, Jia Liu & W.B.Liao, sp. nov.**
urn:lsid:ipni.org:names:77309064-1
粤西雪花

Type. China. Guangdong Province: Yangchun City, Bajia Town, E'huangzhang Nature Reserve, near the Wufu Waterfall, 21°52'N, 111°25'E, a.s.l. 720 m, 3 May 2018, *Wan-Yi Zhao, Jia Liu, Qiao-Ling Ding, Fan Ye YC-2018-02* (holotype: SYS!, Barcode SYS00236851; isotype: SYS!, Barcode SYS00236852) (Figs 1, 2).

Diagnosis. *Argostemma ehuangzhangense* is similar to *A. lamxayanum* and *A. laotica* in its habit and pseudo-verticillate leaves, but differs in having terminal solitary 4-merous flowers, short anthers (1.2–1.5 mm long) opening by longitudinal slits.

Description. ***Terrestrial*** perennial herbs, 1–4 cm tall, attached to the substrate by tubers flattened globose, with a few roots. ***Stems*** erect, densely pubescent, with one pair of scale-like leaves at the lower middle portion. ***Leaves*** four per individual, clustered at the stem apex, verticillate, anisophyllous, petiole 0.5–2 long mm; blades membranous or thinly papery when dried, ovate to elliptic, 5–25 × 3–12 mm, cuneate at base, acute to obtuse at apex, margins entire; adaxial surface green, densely antrorse strigose; abaxial surface grey-white with white particles, sparsely pubescent on the midrib vein and lateral veins; lateral veins 3- or 4-pairs; stipules deciduous. ***Flowers*** solitary, terminal;

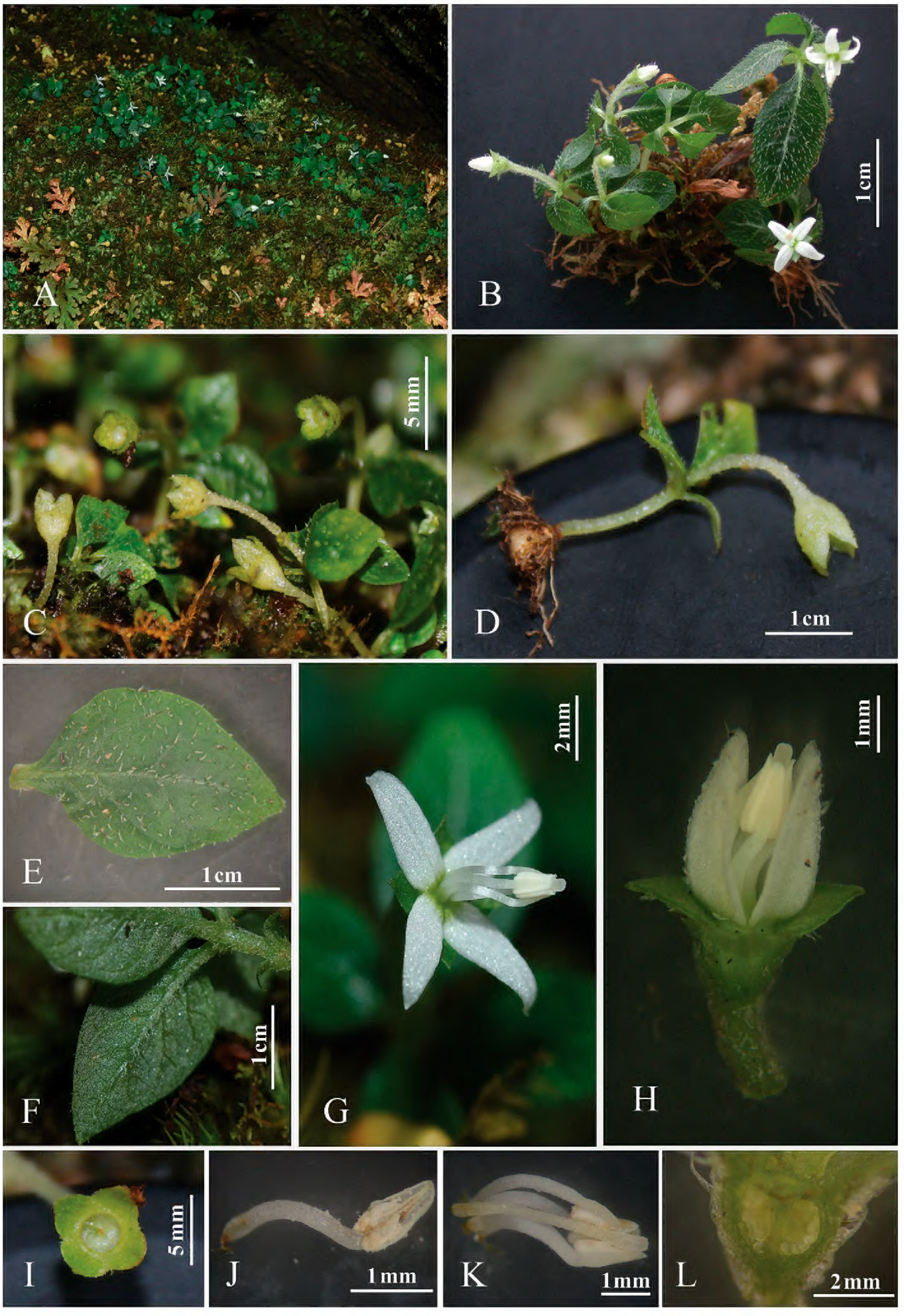

Figure 1. *Argostemma ehuangzhangense* **A** individuals in their natural habitat **B** flowering individuals **C** fruiting individuals **D** side view of an individuals with tuber **E** leaf blade adaxial surface view **F** leaf blade abaxial surface view **G** flower, internal corolla surface view **H** folwer, external corolla surface view **I** capsule, top view **J** stamen **K** style and stigma tightly enclosed by stamens **L** ovary longitudinal section view. (photographs (**A–G**) were taken by Wan-Yi Zhao in the original habitat area of E'huangzhang and photographs (**H–L**) were taken by Jia Liu in SYS Herbarium in May 2018).

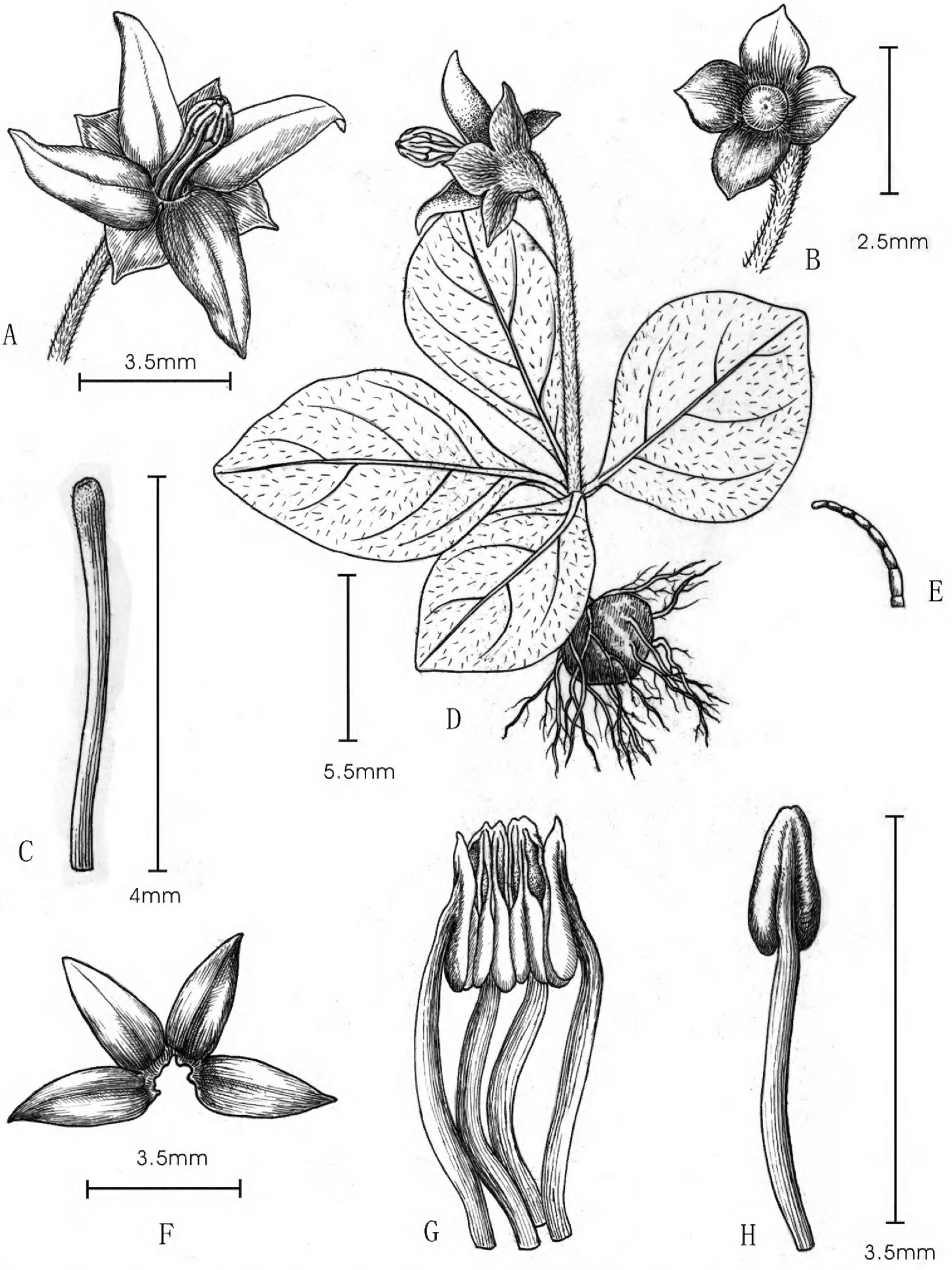

Figure 2. *Argostemma ehuangzhangense* **A** flower **B** fruit **C** style and stigma **D** habit of a mature plant **E** multicellular trichomes present on the stem, pedicel and ovary **F** corolla **G** organization of stamens **H** stamen (Drawn from living plants by Yun-Xiao Liu).

pedicels 0.8–1.8 cm, with densely pubescent, trichomes multicellular. ***Calyx*** densely pubescent, trichomes multicellular, hypanthium portion obovoid; lobes 4, subtriangular, 1–1.3 × 1.1–1.4 mm, abaxially pubescent, adaxially glabrous. ***Corolla*** white, rotate, external surface sparsely pubescent, internal surface glabrous, corolla tube 0.3–0.6 mm long; corolla lobes 4, oblong-lanceolate, 3–4 × 1.5–2 mm. ***Stamens*** 4; filaments free, 3.5–4 mm, exserted; anthers 1.2–1.5 mm long, coherent into a tube, dehiscent longitudinally. ***Ovary*** 2-locular, ovules numerous in each locule; style filiform, ca. 4 mm, with short pubescence, stigma capitate, exserted. ***Capsule*** obovoid, 2–5 mm in diameter, 1–3 mm long, pubescent, crowned by a persistent calyx, without ribs or furrows.

Phenology. This species is recorded flowering in March-May and fruiting in May-September.

Distribution. *Argostemma ehuangzhangense* is endemic to E'huangzhang Nature Reserve, southwestern Guangdong Province. It is currently known only from two populations recorded in county of Dianbai and city of Yangchun.

Habitat. Growing along river on wet sandstone under the evergreen broad-leaf forest at 400–750 m a.s.l.

Etymology. The specific epithet 'ehuangzhangense' is derived from the type locality, E'huangzhang Nature Reserve of the Guangdong Province, in China. This area is the oldest geological platform in the Guangdong Province, in which many endemic species occur (Wang et al. 2003; 2004; Ding et al. 2018). The new species is also expected to occur in the Yunkaishan National Nature Reserve, Maoming City, because this area shares a similar tectonic history with E'huangzhang. Therefore, we proposed for the vernacular name of the species as yuèxīxuěhuā (粤西雪花).

Preliminary conservation status. The species is endemic to the Guangdong Province. According to our field survey, there are only two localities in which *Argostemma ehuangzhangense* is recorded and each population consists of 100–250 individuals. The number of mature individuals of *Argostemma ehuangzhangense* is more than 400, but less than 1000. Thus, we believe that *Argostemma ehuangzhangense* would be considered VU (Vulnerable) in an official IUCN Red List assessment (IUCN Standards and Petitions Subcommittee 2022) according to the D criterion.

Paratypes. China. Guangdong Province: Yangchun City, Bajia Town, E'huangzhang Nature Reserve, 21°52'N, 111°25'E, a.s.l. 704 m, 29 Apr. 2017, *Hua-Gu Ye*, *Zhong-Cheng Liu YHG-06* (SYS); same locality, 5 Aug. 2017, *Hua-Gu Ye*, *Wan-Yi Zhao*, *Zhong-Cheng Liu YC2017-35* (SYS); Yangchun City, Bajia Town, 21°52'N, 111°25'E, a.s.l. 750 m, 1 Aug. 2001, *Hua-Gu Ye 6119* (IBSC); Dianbai County, Luokeng Town, Shuangjifeng, 21°52'N, 111°21'E, a.s.l. 400 m, 8 Aug. 2001, *Hua-Gu Ye 6427* (IBSC).

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